CLAIMS

1. (Original) A micropump, comprising:

a pumping chamber, wherein said pumping chamber includes an inlet for drawing fluid therein and an outlet for expelling said fluid out of said chamber, and

structure for mechanically urging said fluid from said inlet to said outlet, wherein said micropump is fully monolithic forming a monolithic body, said pump having a total thickness of no more than about 12 microns.

2. (Original) The micropump of claim 1, wherein said pumping chamber includes at least one rotatable disc in fluid communication with said fluid, said structure for mechanically urging comprising said rotatable disc.

3. (Original) The micropump of claim 2, wherein the at least one rotatable disc comprises at least one protrusion extending from the disc.

4. (Original) The micropump of claim 3, wherein the at least one protrusion forms a spiral shaped fluid pathway concentric with the at least one rotatable disc.

5. (Original) The micropump of claim 3, wherein the at least one protrusion forms a plurality of radial vanes extending from an axis of rotation of the rotatable disc.

6. (Original) The micropump of claim 2, wherein at least one rotatable disc further comprises a plurality of gear teeth on a side surface of the rotatable disc.

7. (Original) The micropump of claim 6, further comprising at least one crescent shaped diverter positioned in the pumping chamber proximate to the at least one rotatable disc, and wherein an inner surface of the monolithic body includes a plurality of gear teeth for meshing with the at least one rotatable disc.

8. (Original) The micropump of claim 2, further comprising at least one cap forming a portion of the monolithic body and having an opening enabling a driving gear to contact the at least one rotatable disc contained in the monolithic body.

9. (Original) The micropump of claim 2, further comprising a labyrinth seal formed from a first protrusion forming a ring extending generally vertically from a base layer and surrounding the rotatable disc, a second protrusion forming a ring extending generally vertically from the base layer and positioned inside the first protrusion, and a third protrusion forming a ring extending generally vertically from the at least one rotatable disc and positioned between the first and second prostrusions.

10. (Original) The micropump of claim 2, further comprising at least one electrostatic comb drive for rotating the at least one rotatable disc.

11. (Original) The micropump of claim 10, further comprising at least one gear in contact with the electrostatic comb drive and in contact with the at least one rotatable disc.

12. (Original) The micropump of claim 11, wherein the at least one gear comprises a 12:1 torque amplification gear train.

13. (Original) The micropump of claim 1, wherein said pumping chamber includes at least two rotatable gears therein, said structure for mechanically urging comprising said rotating gears.

14. (Original) The micropump of claim 13, wherein the at least two rotatable gears comprises at least three rotatable gears, wherein a first rotatable gear is rotatably attached to a pin substantially at a center point of the base layer and includes a plurality of gear teeth, a second rotatable gear including a plurality of teeth on a side surface is positioned between the first rotatable disc and a side wall of the monolithic body, and a third rotatable gear including a plurality of teeth on a side surface and having a diameter larger then the

second rotatable gear is positioned between the first rotatable gear and a side wall of the monolithic body.

15. (Original) A micropump, comprising:

a monolithic body formed from between about two layers of silicon and about five layers of silicon and having a thickness no more than about 12 microns, wherein the monolithic body comprises a base layer and side walls forming an pumping chamber containing at least one rotatable disc; wherein said pumping chamber includes an inlet for drawing fluid therein and an outlet for expelling said fluid out of said cavity; and

at least one rotatable disc positioned in the pumping chamber for drawing a fluid through the inlet and expelling the fluid out of the outlet.

16. (Original) The micropump of claim 15, wherein the at least one rotatable disc comprises at least one protrusion extending from the disc.

17. (Original) The micropump of claim 15, wherein the at least one protrusion forms a spiral shaped fluid pathway concentric with the at least one rotatable disc.

18. (Original) The micropump of claim 15, wherein the at least one protrusion forms a plurality of radial vanes extending from an axis of rotation of the rotatable disc.

19. (Original) The micropump of claim 15, wherein at least one rotatable disc further comprises a plurality of gear teeth on a side surface of the rotatable disc.

20. (Original) The micropump of claim 19, further comprising at least one crescent shaped diverter positioned in the pumping chamber proximate to the at least one rotatable disc, and wherein an inner surface of the monolithic body includes a plurality of gear teeth for meshing with the at least one rotatable disc.

21. (Original) The micropump of claim 15, wherein the at least one rotatable disc comprises at least three rotatable discs, wherein a first rotatable disc is rotatably attached to a pin substantially at a center point of the base layer and includes a plurality of gear teeth, a second rotatable disc including a plurality of teeth on a side surface is positioned between the first rotatable disc and a side wall of the monolithic body, and a third rotatable disc including a plurality of teeth on a side surface and having a diameter larger then the second rotatable disc is positioned between the first rotatable disc and a side wall of the monolithic body.

22. (Original) The micropump of claim 15, further comprising at least one cap forming a portion of the monolithic body and having an opening enabling a driving gear to contact the at least one rotatable disc contained in the monolithic body.

23. (Original) The micropump of claim 15, further comprising a labyrinth seal formed from a first protrusion forming a ring extending generally vertically from the base layer and surrounding the rotatable disc, a second protrusion forming a ring extending generally vertically from the base layer and positioned inside the first protrusion, and a third protrusion forming a ring extending generally vertically from the at least one rotatable disc and positioned between the first and second prostrusions.

24. (Original) The micropump of claim 15, further comprising at least one electrostatic comb drive for rotating the at least one rotatable disc.

25. (Original) The micropump of claim 24, further comprising at least one gear in contact with the electrostatic comb drive and in contact with the at least one rotatable disc.

26. (Original) The micropump of claim 25, wherein the at least one gear has a 12:1 torque amplification gear train.

27. (Original) A method of pumping fluids, comprising:

rotating at least one rotatable disc positioned in a pumping chamber of a miropump formed from a monolithic body having a thickness no more than about 12 microns and containing the at least one rotatable disc; wherein a fluid is drawn through an inlet in the pumping chamber and expelled from an outlet in the pumping chamber.

28. (Original) The method of claim 27, wherein rotating at least one rotatable disc comprises rotating at least one disc comprising at least one protrusion extending from the disc.

29. (Original) The method of claim 28, wherein rotating at least one rotatable disc having at least one protrusion extending from the disc comprises rotating at least one disc having a spiral shaped protrusion extending from the disc.

30. (Original) The method of claim 28, wherein rotating at least one rotatable disc having at least one protrusion extending from the disc comprises rotating at least one disc having a spiral shaped protrusion extending from the disc.

31. (Original) The method of claim 27, wherein rotating at least one rotatable disc is accomplished using at least one electrostatic comb drive.

32. (Original) The method of claim 27, wherein rotating at least one rotatable disc drives at least one idler gear positioned in the pumping chamber of the at least one rotatable disc.

33. (Original) The method of claim 27, wherein rotating the at least one rotatable disc comprises rotating at least three gears in the pumping chamber.